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May 9, 2014

Dania Zinner
USEPA; Region 8
1595 Wynkoop Street (8EPR-SR)
Denver, CO 80202-1129

Document ID #: 3019-05122014-1

Dear Ms. Zinner:

EPA CONTRACT NUMBER EP-W-10-033
TASK ORDER NUMBER 3019
QA SUPPORT FOR THE LIBBY ASBESTOS SITE

Enclosed please find the Summary Asbestos On-site Audit Report for the on-site audit performed on March 25-26, 2014 at EMSL Analytical, Inc. in Cinnaminson, New Jersey. This report and the accompanying checklist are deliverables under Task 5 of Task Order 3019.

If you have any questions, please feel free to contact me.

Sincerely,

Timothy L. Vonnahme
Audit Group Manager, QATS Program
CB&I Federal Services, LLC
Phone: (702) 895-8729
E-Mail Address: timothy.vonnahme@cbifederalservices.com

cc: Administrative Contracting Officer (letter only)
Audit Group Files

REPORT

FOR

TASK ORDER NUMBER 3019
QUALITY ASSURANCE SUPPORT FOR THE LIBBY ASBESTOS SITE

SUMMARY ASBESTOS ON-SITE AUDIT REPORT

EMSL Analytical, Inc. (Cinnaminson, NJ)

Prepared by:

The Data Auditing Group
Quality Assurance Technical Support Program
CB&I Federal Services LLC
2700 Chandler Avenue
Las Vegas, Nevada 89120

April 24, 2014

QATS Contract Number: EP-W-10-033

Prepared for:

Dania Zinner
Task Order Manager

Region 8
U.S. Environmental Protection Agency
1595 Wynkoop Street
Denver, CO 80202

TABLE OF CONTENTS

LABORATORY INFORMATION AND AUDIT SCOPE

This report summarizes the findings of an Asbestos on-site laboratory audit of the EMSL Analytical, Inc. Laboratory in Cinnaminson, New Jersey conducted on March 25-26, 2014. The audit was conducted in support of the United States Environmental Protection Agency (EPA) to assess the performance of laboratories supporting Libby Superfund Site activities. CB&I Federal Services LLC Quality Assurance Technical Support (QATS) staff participation in the on-site audit and subsequent preparation of this report was performed under Task 5, Task Order 3019, QATS Contract EP-W-10-033.

Detailed information regarding the subject laboratory is as follows:

Date of On-site:	**March 25-26, 2014**
Laboratory:	**EMSL Analytical, Inc.** **200 Route 130 North** **Cinnaminson, NJ 08077** **800.220.3675**
Special Projects Manager:	**Robyn Denton**
Audit Team	
US EPA:	**Charlie Appleby, ASB CLP Project Manager**
CB&I QATS:	**Michael P. Lenkauskas, CQA, Lead Auditor**

The Audit Team, which was comprised of EPA Analytical Services Branch (ASB) and CB&I Federal Services LLC QATS personnel, performed the technical and evidentiary aspects of the on-site audit. The technical part of the audit involved an evaluation of the laboratory's facilities, personnel, and capabilities to process samples and data as described in the Libby-specific guidance documents. Processes evaluated included sample receipt, sample storage, sample tracking, sample preparation, sample analysis, data review, and data package assembly. Laboratory instrumentation and equipment were inspected for proper maintenance and calibration, and laboratory personnel were interviewed to determine proficiency in their assigned responsibilities. Specific instrumentation and areas inspected included sample receiving, Phase Contrast Microscopy (PCM), Polarized Light Microscopy (PLM), Transmission Electron Microscopy (TEM), and the laboratory's capability to provide the required hardcopy and electronic data deliverables (EDDs).

The evidentiary part of the evaluation involved an assessment of laboratory documentation for accuracy, completeness, and defensibility. The Laboratory Quality Assurance Manual (QAM) and Standard Operating Procedures (SOPs) were assessed for availability and accuracy to observed procedures, and instrument calibration and maintenance logbooks were reviewed for completeness, traceability, and accuracy. During the course of the audit, the Libby-Specific Asbestos Laboratory On-site Audit Checklist was completed by the QATS Auditor. The checklist is provided as an attachment to this report (EPA only).

EXECUTIVE SUMMARY

An Asbestos on-site audit of EMSL Analytical, Inc. in Cinnaminson, New Jersey was performed on March 25-26, 2014 in support of Libby Superfund Site activities. Areas assessed included facilities, equipment, personnel, and documentation as related to the laboratory's capability to process samples collected from the Libby Superfund Site and to test for Asbestos and other fibers in accordance with Libby-specific requirements. The on-site audit identified six (6) deficiencies which are summarized below by laboratory area:

Sample Receipt, Storage, Log-in, and Chain-of-Custody – Written procedures describing remote login procedures are not available.

Phase Contrast Microscopy – The results of daily reference slide analyses are not documented; therefore, results failing acceptance criteria are not being recorded.

Indirect and Direct Preparation of Air Filter and Dust Samples – Analyst training for preparing various media (i.e., bark, duff, and FBAS) for TEM analyses has not been performed. (Note: this is a repeat defect). Balances do not contain updated calibration labels as required in the project and laboratory procedures.

Data Management – The electronic spreadsheet used to track electronic and hardcopy deliverable due dates did not have a column for tracking the due dates of hardcopy deliverables. (Note: this was corrected prior to the close of the audit.)

Quality Control and Quality Assurance – The Internal Audit SOP was not reviewed and revised at the 3-year frequency required in the Laboratory's QAM.

With the exception of the deficiencies noted above and in the following report, the on-site evaluation revealed that the EMSL Analytical, Inc. laboratory in Cinnaminson, NJ to have sufficient facilities, equipment, and staff to effectively analyze samples in accordance with the Libby-specified methodologies. All staff and management were cooperative, readily answered questions by the Audit Team, and appeared to be responsive to the identified audit findings.

AUDIT FINDINGS

Sample Receipt, Storage, Log-in, and Chain-of-Custody (COC)

The sample receipt area, located in the reception area, was clean and well organized. The Audit Team interviewed the Special Projects Data Coordinator on the procedures used to inspect, process, and login samples collected from the Libby Superfund Site. The Special Projects Data Coordinator demonstrated a clear understanding of the process for sample inspection, processing, and distribution. One deficiency related to the lack of an SOP for performing remote login of samples received at the EMSL facilities in Denver, CO and New York, NY was identified:

1. Written procedures describing how the Special Projects Data Coordinator remotely logs in and generates the necessary documents for samples collected at the Libby Superfund Site and distributed to the EMSL Analytical Laboratories in Denver, CO and New York, NY are not available. Although Section 5.4.2 of the Laboratory's Sample Chain-of-Custody references a Remote Login SOP, the SOP was not available. The requirement that instructions or procedures for the activities affecting the quality of analytical services be developed by management is described in Section 5.4.1 of the Laboratory's QAM. (Checklist No. 4.6.1)

   Recommended Corrective Action – Ensure that written procedures for the remote login procedures used to process samples and generate documents for the EMSL Analytical Laboratories in Denver, CO and New York, NY are available.

Phase Contrast Microscopy (PCM)

The PCM area was clean and organized, with adequate equipment and instrumentation for preparing and analyzing air samples by PCM. The analyst demonstrated a clear understanding of the applicable techniques for inspecting and preparing air filters samples as described in the applicable Libby-specific guidance documents. One deficiency concerning quality control analyses was identified:

2. The results from a daily reference slide, which is required to be read by each analyst prior to analyzing samples, are entered into an electronic spreadsheet which indicates whether or not the result is within criteria and, therefore, whether the analyst can continue to analyze client samples. However, there is no mechanism to document results that fail criteria. As a result, there is no way to determine whether the analyst has entered multiple numbers until one is entered that meets criteria or analyzed client samples after multiple failed attempts. The requirements that the analysis fall within the acceptable limits before analysis may proceed, and that a Corrective Action Response (CAR) is initiated for those results that fall outside the limits are described in Section 8.5.3 of the Laboratory's Asbestos and Other Fibers by PCM SOP. (Checklist No. 5.8.1)

   Recommended Corrective Action – Ensure that results of failed daily reference analyses are recorded in a permanent manner and that a CAR is initiated.

Indirect and Direct Preparation of Air Filter and Dust Samples for TEM Analysis

The TEM preparation area was clean and organized. Adequate equipment and instrumentation were available for preparing air, dust, water, tree bark, and duff samples for TEM analysis using the appropriate direct and indirect preparation techniques. The analyst demonstrated a clear understanding of the applicable techniques for inspecting and preparing air filters samples as

described in the applicable Libby-specific guidance documents. Two deficiencies concerning equipment calibration and training were identified:

3. During the interview, it was determined that the analyst has received training for the direct and indirect preparation of TEM air filter samples received from the Libby Superfund Site; however, training in the preparation of other media that could be received during the upcoming sampling season (i.e., bark, duff, and FBAS) had not been received. The training requirements for laboratory personnel are described in Section 4.2.3.3 of the Site-wide Quality Assurance Reference Document (QARD, Rev. 1), and Section 5.2.2 of the Laboratory's Quality Assurance Manual (QAM). (Checklist No. 10.2.1)

   Recommended Corrective Action – Ensure that additional personnel are trained in the preparation of all media that could be received from the Libby Superfund site for TEM analysis.

4. At the time of the audit, the labels on the analytical balances indicated that the balances were past due the 12 month recalibration by an outside vendor. However, it was later determined that the labels applied were incorrect. Supporting documentation indicated that the balances had been calibrated as required within the last 12 months. The requirement that all balances be labeled with the date of the certification, initials of the individual performing the calibration and certification, and the date the next service is to be performed are described in Section 12.2.1 of the project-specific SOP SRC-Libby-01 (Rev. 3) and Section 5.5.3 of the Laboratory's QAM. (Checklist Nos. 6.4.4, 6.15.1, 8.4.4.5, and 8.16.1)

   Note: This finding also applies to the balances used to weigh samples for the PLM-GRAV and PLM-VE procedures.

   Recommended Corrective Action – Ensure that all balances have calibration labels with a sticker indicating the correct date of the certification, initials of the individual performing the calibration and certification, and the date the next service is to be performed.

Transmission Electron Microscopy (TEM) Analysis

The area was clean and well organized. The TEM instruments used to support the project were well-maintained, calibrated at the specified frequencies, and equipped with digital photography capabilities. The TEM analyst interviewed demonstrated a clear understanding of the applicable techniques for identifying and recording structures as described in the applicable Libby-specific guidance documents. No deficiencies concerning TEM analyses were identified.

Polarized Light Microscopy (PLM) Analysis

The PLM area has three work stations, each equipped to analyze samples received from the Libby Superfund Site. Each work station is equipped with a stereomicroscope, functional HEPA hood, polarized light microscope, refractive index (RI) liquids, and tools for manipulating samples. The PLM area was clean and organized; the instrumentation well-maintained; and the quality of the documentation acceptable. The analyst interviewed demonstrated a clear understanding of PLM instrument maintenance and calibration, and sample preparation, analysis, and documentation.

As a follow-up to the recent PLM inter-laboratory study, the Audit Team asked that the analyst reanalyze samples which were reported as weakly discordant from the original analysis. From the reanalysis, a confirmed result was reported. No PLM deficiencies were identified.

Data Management

Data management activities associated with the analysis of samples collected at the Libby Superfund Site are performed by EMSL's Special Projects group, which reviews all records of sample receipt, preparation, and analysis for accuracy, compliance, and completeness. This group is also responsible for generating the hardcopy and electronic deliverables for special projects, including the Libby Superfund Site, for all participating EMSL Analytical laboratories. The Special Projects area was clean and well organized, and the procedures to ensure data completeness and integrity adequate. The Special Projects Data Coordinator responsible for data management activities clearly described her duties with respect to data review and the generation of data deliverables. One deficiency concerning the tracking of hardcopy deliverable due dates was identified:

5. The electronic spreadsheet used by the Special Projects Data Coordinator to track both electronic and hardcopy deliverable due dates did not have a column for tracking the due dates of hardcopy deliverables. Having this column would allow the laboratory the ability to notify the client when data would not be submitted by the specified due date. The requirement to provide the customer with information regarding deliverables that cannot be provided on time is described in Section 4.7.4 of the Laboratory's QAM. (Checklist No. 9.2.4.2)

   Recommended Corrective Action – Prior to the audit debriefing, a column indicating hardcopy deliverable due dates was added to the deliverables tracking spreadsheet. Therefore, no further corrective action is necessary.

Quality Control and Quality Assurance

The Audit Team interviewed the Quality Assurance Officer (QAO), reviewed the laboratory's QAM and SOPs, and performed a cursory review of the laboratory's air monitoring results, non-conformance reports, laboratory certifications, internal audit reports, and the training files of select laboratory personnel. The QAO demonstrated an understanding of and commitment to the laboratory's current quality system. One deficiency concerning the timely review of laboratory SOPs was identified:

6. The Internal Audit SOP has not been revised since 2010, which exceeds the laboratory SOP review cycle requirement of a minimum of every three years. The requirement to review controlled documents once every three years to determine their continued suitability is described in Section 4.3.1.5 of the laboratory's QAM. (Checklist No. 10.3.1.1)

   Recommended Corrective Action – With the exception of the QAM, which is reviewed on an annual basis, ensure that all controlled documents are reviewed at a minimum of every three years to determine the continued suitability.

CORRECTIVE ACTION APPLIED FROM THE PREVIOUS AUDIT FINDINGS

The on-site laboratory evaluation included an assessment of the findings reported in the previous Summary Asbestos On-site Audit Report for the on-site audit performed on October 8, 2013. Of the three findings identified in the previous on-site audit, the laboratory has completely

addressed two (66.7%) and partially addressed one (33.3%). The following are the findings identified during the previous on-site audit, the laboratory's verbatim responses to the findings (where applicable), and observations made during the current on-site audit.

Indirect and Direct Preparation of Air Filter and Dust Samples

1. With the departure of a key staff member, the laboratory no longer has adequate personnel with the training necessary to prepare duff and tree bark samples for analysis by TEM. The training requirements for laboratory personnel are described in Section 4.2.3.3 of the Site-wide Quality Assurance Reference Document (QARD, Rev. 0) and Section 5.2.2 of the laboratory's Quality Assurance Manual (QAM).

   Recommended Corrective Action – Ensure that properly trained personnel are available to prepare tree bark, duff, and other samples received from the Libby Superfund site.

   EMSL Corrective Action Response (12/20/2013): *The lab has begun to train additional staff in Libby sample preparation. Currently, three staff members are trained in Libby specific preparation of TEM filters. These staff members are: Robyn Denton, Leslie McCluskey- Eissing and Kim Ford. As different media is received, media specific training will be completed.*

   Effectiveness Check (03/25-26/2014): This deficiency has been partially addressed. Although some training has been completed for the indirect preparation of air and dust samples, training for other media received from the Libby Superfund Site (i.e., bark, duff, and FBAS indirect preparation) has not yet been performed.

Polarized Light Microscopy (PLM) Analysis

2. One of the PLM microscopes used to analyze Libby samples incorrectly utilized a 530 nm compensator plate, rather than a 550 nm compensator plate as specified in the Libby project-specific procedure. Although this deviation is recorded on the bench sheet, it is not described in sufficient detail and is not described in the applicable data package narratives. The requirement to use a 550 nm compensator plate is described in Section 10.3.1.12 of both the PLM-VE (SRC-Libby-03, Rev. 3) and PLM-Grav (SRCLibby-01, Rev. 3).

   Recommended Corrective Action – Ensure all deviations from project-specific requirements are described in sufficient detail in the applicable data package narratives.

   EMSL Corrective Action Response (12/20/2013): *The lab has ensured that any deviations from project specific requirements are described in the sample case narrative.*

   Effectiveness Check (03/25-26/2014): This deficiency has been completely addressed. Since this finding was identified, the project-specific SOPs have been modified through Laboratory Modification LB-000097 to allow for 530-550 nm compensator plates, which is consistent with the NVLAP requirements.

Data Management

3. The laboratory was not including the data package completeness checklists with the data deliverables. These checklists are provided with both the PLM-VE and PLM-GRAV EDD templates. The requirement to provide a competed checklist with each PLM-VE,

PLM-GRAV, and NIOSH 9002 hardcopy (scanned) data deliverable is described in the "Data Pkg Checklist" tab of each of the applicable EDD templates.

Recommended Corrective Action – Ensure that data package checklists are provided with each PLM-VE, PLM-GRAV, and NIOSH 9002 hardcopy deliverable.

EMSL Corrective Action Response (12/20/2013): *Robyn Denton met with staff members regarding the use of the data package checklists. Since the previous on-site audit, EMSL has been including the checklist with all PLM-VE, PLM_GRAV and NIOSH 9002 hard copy deliverables. Please see attachment 3A, which is from a recent PLM VE Data package.*

Effectiveness Check (03/25-26/2014): This deficiency has been completely addressed.

CONCLUSIONS

An Asbestos on-site audit was performed at EMSL Analytical, Inc. in Cinnaminson, New Jersey on March 25-26, 2014. The audit involved an assessment of the laboratory's facility, instrumentation, personnel, and laboratory procedures to process samples received from the Libby Superfund Site in Libby, Montana. The on-site audit identified the following six (6) deficiencies:

- Written procedures describing remote login procedures are not available.
- The results of daily PCM reference slide analyses are not documented.
- Additional training is needed for preparing various media for TEM analyses. (Note: this is a partial repeat defect).
- Balances do not contain updated calibration labels as required in the project and laboratory procedures.
- The electronic spreadsheet used to track electronic and hardcopy deliverable due dates did not have a column for tracking the due dates of hardcopy deliverables. (Note: this was corrected prior to the audit close).
- The Internal Audit SOP was not reviewed at the 3-year frequency required in the Laboratory's QAM.

With the exception of the deficiencies noted above, the on-site evaluation revealed the laboratory to have sufficient facilities, equipment, and staff to effectively analyze samples in accordance with the specified methodologies and Libby-specific protocol. All staff and management were cooperative, readily answered questions by the Audit Team, and appeared to be responsive to the identified audit findings.

ATTACHMENT

Libby-Specific Asbestos Laboratory On-site Audit Checklist (EPA Only)

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable

Date(s) of On-site: March 25-26, 2014

Laboratory: EMSL Analytical, Inc.

Address: 200 Route 130 North
Cinnaminson, NJ 08077

Telephone: (800) 220-3675

Laboratory Personnel Contacted

Name	Title
Robyn Denton	Special Projects Manager/PCM Analyst
Charles LaCerra	Special Projects/Sample Receiving Manager
Garret Vliet	PLM Supervisor
Meghan Smollock	Special Projects Data Coordinator
Melissa Klinedinst	PLM QC Group Leader
Leslie McCluskey-Eissing	TEM Analyst

Evaluation Team

Name	Title
Charlie Appleby	EPA-ASB, CLP Project Manager
Michael P. Lenkauskas	CB&I Federal Services LLC, Lead Auditor

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

TABLE OF CONTENTS

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable

Date(s) of On-site: March 25-26, 2014

1.0 LABORATORY STATUS & CAPABILITIES	Yes	No	Comments
1.1 Which of the following capabilities does the laboratory possess:			
1.1.1 Phase Contrast Microscopy (PCM)?	☒	☐	
1.1.2 Polarized Light Microscopy (PLM)?	☒	☐	
1.1.3 Transmission Electron Microscopy (TEM)?	☒	☐	
1.1.4 Others (list)?	☒	☐	Full Service Lab.
1.2 Is the laboratory currently receiving samples from Libby Superfund Site Operable Units?	☒	☐	

If "**YES**," complete the following table:

Method	Media	Comments
ISO 10312	Various	Air, tree bark, duff, water, FBAS, etc…
AHERA	Air	
ASTM	Dust	
PLM	Soil	
PCM	Air	

2.0 LABORATORY SECURITY	Yes	No	Comments
2.1 Are visitors required to sign in?	☒	☐	
2.2 Are all entrances to the laboratory secure?	☒	☐	

3.0 PROJECT INITIATION/PROJECT MANAGEMENT	Yes	No	Comments
3.1 Are there designated project managers or a project management team to ensure received samples are properly processed?	☒	☐	Robyn Denton
3.2 Are project-specific requirements and procedures communicated to laboratory personnel and available for reference:			
3.2.1 Project-specific SOPs?	☒	☐	All project specific documents are available in the CDM Smith eRoom, and laboratory documents are available on the laboratory's server.
3.2.2 Laboratory Modifications?	☒	☐	
3.2.3 SAP Analytical Summaries?	☒	☐	
3.2.4 Project-specific Electronic Data Deliverables (EDDs)?	☒	☐	
3.2.5 Other (list)?	☐	☒	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

4.0 SAMPLE RECEIPT, LOG-IN, STORAGE, & TRACKING	Yes	No	Comments
4.1 Is the sample receiving area adequate, clean, and orderly?	☒	☐	

Personnel Interviewed

Name	Title	Experience
Meghan Smollock	Special Projects Data Coordinator	2 Years
Charles LaCerra	Sample Receiving Manager	14 Years
Robyn Denton	Special Projects Manager	13 years

4.2 Sample Receipt	Yes	No	Comments
4.2.1 Is there a sample custodian and designated alternate responsible for sample receipt and log-in?	☒	☐	See Additional Comments below.
4.2.2 Is the sample custodian or alternate available to receive and log-in samples at any time delivery services are operating?	☒	☐	
4.2.3 Are sample shipping containers opened in a HEPA hood (as necessary) to both minimize personal exposure and safeguard against laboratory contamination?	☒	☐	
4.2.4 Does the sample custodian verify and record the following when inspecting shipments and reviewing documentation:			
4.2.4.1 Presence and condition of custody seals?	☒	☐	
4.2.4.2 The SAP analytical summary is referenced or provided?	☒	☐	
4.2.4.3 Presence or absence of Chain-of-Custody (COC) records?	☒	☐	
4.2.4.4 Presence or absence of air bill sticker(s)?	☒	☐	
4.2.4.5 Sample condition?	☒	☐	
4.2.4.6 Presence of packaging or packing material which could compromise samples (i.e., vermiculite & polystyrene)?	☒	☐	
4.2.4.7 Problems/discrepancies between samples, documentation, client requests, etc.?	☒	☐	
4.2.4.8 Bulk and air samples received separately?	☒	☐	
4.2.5 Are COC records signed and dated at the time of sample receipt?	☒	☐	Time stamped upon arrival.
4.2.6 Is a system in place to contact the client in case of absent documentation or discrepancies between COCs, client requests, etc.?	☒	☐	
4.2.7 Are subsequent resolutions to problems and discrepancies documented?	☒	☐	As described in project-specific COC SOP.
4.3 Sample Identification			
4.3.1 Are sample receipt identification logbooks, or a LIMS, used to log-in samples and assign unique laboratory identification numbers?	☒	☐	LIMS is used.
4.3.1.1 Does the logbook or logging system serve as a direct cross-reference between laboratory ID numbers and client ID numbers?	☒	☐	

Additional Comments:

Meghan is responsible for inspection, review, login and distribution of all samples received from the Libby Superfund Site. In addition, Meghan also remotely logs in Libby samples received at the EMSL locations in Denver, CO and New York, NY.

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

4.0 SAMPLE RECEIPT, LOG-IN, STORAGE, & TRACKING	Yes	No	Comments
4.4 Sample Storage			
4.4.1 Are storage facilities sufficient?	☒	☐	See Additional Comments below.
4.4.2 Is the sample storage area secured to prevent entry of unauthorized personnel?	☐	☐	
4.4.3 Is a logbook or other means used to record sample locations?	☐	☐	
4.4.4 Are samples easy to locate from logbook references? Select and find a previously analyzed sample (Sample no. N/A)	☒	☐	Did not track an individual sample but inspected off-site facility as described below.
4.5 Sample Tracking			
4.5.1 Is a system in place to keep track of samples entering and leaving the storage, sample preparation, and analysis areas?	☒	☐	
4.5.2 Is the retention and/or disposal of unused portions of samples and prepared samples documented?	☒	☐	
4.5.2.1 Are project-specific retention and/or disposal requirements communicated and followed?	☒	☐	
4.6 Standard Operating Procedures (SOPs)			
4.6.1 Are the applicable laboratory SOPs available and followed by laboratory personnel (list)?	☐	☒	Refer to Finding No. 1 of the On-site Audit Report.

Document Title	Control No.	Description
Sample Chain-of-Custody	Rev. 3 (8/16/2012)	

4.7 Document Control:	Yes	No	Comments
4.7.1 Are all logbooks, notebooks, forms, or other laboratory documents legible, accurate, and complete (list)?	☒	☐	

Document Title	Description/Comments
Libby-specific QC Log books	Used to assign QC samples for Libby projects

Additional Comments:

Samples are archived for long-term and short-term storage at a remote facility, which the Audit Team visited on the afternoon of the first day of the audit. The storage facility, which is also used to archive data, is secure and organized with EMSL personnel on-site during normal business hours.

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

5.0 PHASE CONTRAST MICROSCOPY (PCM)	Yes	No	Comments
5.1 Does the laboratory perform PCM analyses on samples received from the Libby Superfund site? If "**NO**," proceed to Section 6.0 of the checklist.	☒	☐	
5.2 Is the PCM area adequate, clean, and orderly?	☒	☐	
5.3 Are steps taken to prevent the cross-contamination of equipment, supplies, and reagents?	☒	☐	

Personnel Interviewed

Name	Title	Experience
Robyn Denton	Special Projects Manager	13 years

5.4 Methods and Guidance Documents	Yes	No	Comments
5.4.1 Are the applicable guidance documents available for reference:			
5.4.1.1 NIOSH Method 7400 (Issue 2), 1994?	☒	☐	
5.4.1.2 Other (list)?	☐	☒	
5.4.2 Are project-specific requirements communicated to laboratory personnel and available for reference:			
5.4.2.1 Most recent revision of Laboratory Modification LB-000015?	☒	☐	All project specific documents and EDD templates are available in the CDM Smith eRoom.
5.4.2.2 SOP EPA-Libby-08?	☒	☐	
5.4.2.3 SAP Analytical Summaries?	☒	☐	
5.4.2.4 Project-specific Electronic Data Deliverables (EDDs)?	☒	☐	
5.4.2.5 Other (list)?	☐	☒	
5.5 Equipment			
5.5.1 Ventilation Hoods:			
5.5.1.1 Checked routinely and recorded in a permanent logbook?	☒	☐	
5.5.2 Are the microscopes used to analyze samples equipped with the following:			
5.5.2.1 Positive phase contrast, with green or blue filter?	☒	☐	
5.5.2.2 Adjustable field iris?	☒	☐	
5.5.2.3 Eyepiece (8 to 10X)?	☒	☐	
5.5.2.4 Phase magnification (40 to 45X)?	☒	☐	
5.5.2.5 Walton-Beckett Graticule?	☒	☐	
5.5.2.6 Stage micrometer with 0.01 mm subdivisions?	☒	☐	
5.5.3 Are microscope and phase ring alignment checks conducted daily?	☒	☐	
5.5.4 Is resolution periodically checked using an HSE/NPL slide?	☒	☐	
5.5.5 Are maintenance and calibration activities recorded in microscope-specific logbooks?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

5.0 PHASE CONTRAST MICROSCOPY (PCM)	Yes	No	Comments
5.6 Sample Preparation			
5.6.1 Are filters prepared as described in the applicable method(s)?	☒	☐	
5.6.2 Are filters that are visibly overloaded (>25%) or that contain loose debris prepared indirectly as described in SOP EPA-Libby-08?	☒	☐	
5.7 Sample Analysis			
5.7.1 Are the appropriate counting rules used (A or B)?	☒	☐	"A" rules are followed.
5.7.2 How are the fields and fibers tracked and recorded? Calibrated double counters			
5.8 Quality Control			
5.8.1 Is each analyst provided a minimum of one reference slide per work day?	☒	☐	Refer to Finding No. 2 of the On-site Audit Report.
5.8.2 Are recounts analyzed at a frequency of 1 per 10 samples analyzed?	☒	☐	
5.8.2.1 For count pairs not within acceptance limits, are associated samples recounted?	☒	☐	
5.9 Standard Operating Procedures (SOPs)			
5.9.1 Are the applicable laboratory SOPs available and followed by laboratory personnel (list)?	☒	☐	

Document Title	Control No.	Description
Asbestos & Other Fibers by PCM	Rev. 14.7 (6/14/2013)	

5.10 Document Control	Yes	No	Comments
5.10.1 Are all logbooks, notebooks, forms, or other laboratory documents legible, accurate, and complete (list)?	☒	☐	

Document Title	Description/Comments
PCM Calibration Logbook	Track microscope and counter calibrations

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.1 Are the grid preparation areas adequate, clean, and orderly?	☒	☐	
6.2 Are bulk samples prepared in an area separate from that used to prepare air and dust samples?	☒	☐	
6.3 Are steps taken to prevent the cross-contamination of equipment, supplies, and reagents?	☒	☐	

Personnel Interviewed

Name	Title	Experience
Leslie McCluskey-Eissing	TEM Analyst	2 years
Robyn Denton	Special Projects Manager	13 Years

6.4 Equipment & Supplies	Yes	No	Comments
6.4.1 Ventilation Hoods:			
6.4.1.1 Checked routinely and recorded in a permanent logbook?	☒	☐	
6.4.2 Drying oven:			
6.4.2.1 Checked routinely and recorded in a permanent logbook?	☒	☐	Two separate ovens calibrated to 60 and 80 degrees Celsius.
6.4.3 Muffle furnace:			
6.4.3.1 Checked routinely and recorded in a permanent logbook?	☒	☐	Four ovens calibrated to 480 degrees Celsius.
6.4.4 Analytical balances:			
6.4.4.1 Checked routinely and recorded in a permanent logbook?	☒	☐	Refer to Finding No. 4 of the
6.4.4.2 Calibrated within the last 12 months by a certified technician?	☒	☐	On-site Audit Report.
6.4.5 Plasma Asher (refer to the most recent revision of Laboratory Modification LB-000085):			
6.4.5.1 Calibrated at least quarterly and recorded in a permanent logbook?	☒	☐	
6.4.6 Sputter Coater (Vacuum evaporator):			
6.4.6.1 Checked routinely and recorded in a permanent logbook?	☒	☐	
6.4.7 Filtration Apparatus (for indirect preparation):			
6.4.7.1 Are disposable funnels used (record catalogue #)?	☒	☐	The EFA of each bag is checked and recorded on the bag with the most recent EFA identified as having an EFA of 364.9 mm^2.
6.4.7.2 Has the Effective Filtration Area (EFA) been determined and recorded for each funnel lot?	☒	☐	
6.4.8 TEM Grids:			
6.4.8.1 Is documentation for average grid opening determination available?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.5 Direct and Indirect Preparation Methodology			
6.5.1 What method(s) does the laboratory use to prepare air and dust samples for TEM analysis:			
6.5.1.1 40 CFR, Chapter 1, Part 763, Subpart E - AHERA?	☒	☐	
6.5.1.2 ISO 10312:1195 E - Determination of Asbestos Fibers?	☒	☐	
6.5.1.3 ASTM D 5755-09 - Micro vacuum Sampling and Indirect Analysis of Dust by TEM?	☒	☐	
6.5.1.4 Others (list)?	☒	☐	EPA 100.2
6.5.2 Are project-specific requirements communicated to laboratory personnel and available for reference:			
6.5.2.1 Laboratory Modifications?	☒	☐	All project specific documents are available in the CDM Smith eRoom.
6.5.2.2 Project-specific SOPs?	☒	☐	
6.5.2.3 SAP Analytical Summaries?	☒	☐	
6.5.2.4 Other (list)?	☐	☒	
6.6 Sample Inspection			
6.6.1 Are air filter cassettes carefully wet-wiped prior to being transferred to the clean preparation area for inspection?	☒	☐	
6.6.2 Are air filter samples which are visibly overloaded, exhibit uneven loading, or contain loose debris, prepared indirectly?	☒	☐	
6.6.3 Are all ambient air samples dried upon receipt at the laboratory prior to preparation and analysis (refer to the most recent revision of Laboratory Modification LB-000055B)?	☒	☐	
6.6.3.1 Is a drying blank (DB) prepared?	☒	☐	
6.7 Direct Preparation of MCE and Polycarbonate (PC) Filters			
6.7.1 Are MCE filters collapsed using either a Di-Methyl Formamide (DMF) or Acetone Atmosphere (AA) technique (describe technique)? Refer to Laboratory Modification LB-000091 for acetone use.	☒	☐	
6.7.2 Is plasma etching performed on collapsed MCE filters?	☒	☐	
6.7.2.1 Is a 5 to 10% layer of the collapsed surface removed during etching?	☒	☐	5% is etched.
6.7.3 Are collapsed MCE filters and secured polycarbonate filters transferred to a vacuum evaporator for carbon coating?	☒	☐	
6.7.4 Are excised filter sections placed on the appropriately labeled TEM grids and cleared using a Jaffe Washer or an equivalent technique (describe)?	☒	☐	
6.7.5 Are samples checked for remaining filter residue after clearing?	☒	☐	
6.7.5.1 If residue remains, is condensation washing or an equivalent technique used (describe technique)?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.8 Indirect Sample Preparation of Air and Dust Samples			
6.8.1 Are the applicable Libby guidance documents available for reference:			
6.8.1.1 SOP EPA-Libby-08 - Indirect Preparation of Air and Dust Sample for TEM Analysis?	☒	☐	
6.8.1.2 Most recent revision of Laboratory Modification LB-000091?	☒	☐	
6.8.2 Sample filtration:			
6.8.2.1 Are the applicable SAP Analytical Summaries reviewed to determine whether or not filter samples must be ashed?	☒	☐	
6.8.2.2 Are cassettes examined for loose material?	☒	☐	
6.8.2.2.1 If loose material or uneven loading is not evident, is a portion of the air samples retained?	☒	☐	
6.8.2.2.2 If loose material is evident, is the loose material filtered along with the air filter?	☒	☐	
6.8.2.3 Ashing (if applicable):			
6.8.2.3.1 Are filters covered with aluminum foil and placed in a plasma asher?	☒	☐	
6.8.2.3.2 Is the plasma asher operated at minimum power?	☒	☐	
6.8.2.3.3 Is 100% ashing confirmed by visual observation?	☒	☐	
6.8.2.4 Are air filters, loose material, dust, or ash, rinsed into a beaker and brought to a final volume of 100 mL with particle-free water?	☒	☐	
6.8.2.4.1 Adjusted to a pH of 3-4 with a 10% solution of Glacial Acetic Acid (refer to Laboratory Modification LB-000091 exemption)?	☒	☐	
6.8.2.4.2 Sonicated for 3 minutes and allowed to settle for 2 minutes prior to filtering?	☒	☐	
6.8.2.5 Are the appropriate aliquots of filtrate passed through a disposable 25 mm filter assembly with a 0.2 µm MCE filter with a 5.0 µm MCE support pad?	☒	☐	
6.8.2.6 Is a secondary filter loading of between 10% and 25% achieved?	☒	☐	
6.8.3 Are serial dilutions performed as necessary?	☒	☐	
6.8.4 Are all dilution volumes recorded on an indirect preparation bench sheet and provided in the associated data deliverable?	☒	☐	
6.8.5 Are TEM grids prepared as described in Section 6.7 of this checklist?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.9 Water Sample Preparation			
6.9.1 What method(s) does the laboratory use to prepare water samples for TEM analysis:			
6.9.1.1 EPA Method 100.2 - Determination of Asbestos Structures Over 10 µm in Length in Drinking Water?	☒	☐	
6.9.1.2 EPA Method 100.1 - Determination of Asbestos Fibers Drinking Water?	☒	☐	
6.9.1.3 Others (describe)? _____	☐	☒	
6.9.2 Is sample preparation performed in accordance with the most recent revision of Laboratory Modification LB-000020:			UV light source is broken. However, a new one is on order and will arrive before sampling begins.
6.9.2.1 Do samples undergo treatment with ozone/UV light?	☒	☐	
6.9.2.2 Are Sample aliquots of no less than 1 mL poured though MCE or PC filters with a pore size of 0.22 µm or smaller?	☒	☐	
6.9.2.3 Are the following processes QC'd by a second person and documented by an initial and date on the preparation bench sheet:			
6.9.2.3.1 Ozone treatment?	☒	☐	
6.9.2.3.2 Filtration?	☒	☐	
6.9.2.3.3 Assignment to Petri dishes?	☒	☐	
6.9.2.3.4 Placement on glass slides for etching and carbon coating?	☒	☐	
6.9.2.3.5 Grid preparation?	☒	☐	
6.9.2.4 After aliquots have been filtered, is the remaining volume archived in its original container until the Laboratory Controller (LC) requests it be filtered for permanent archival?	☒	☐	
6.9.3 Are all dilution volumes recorded on an indirect preparation bench sheet, and provided in the associated data deliverable?	☒	☐	
6.9.4 Are TEM grids prepared as described in Section 6.7 of this checklist?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.10 OU3 Tree Bark Sample Preparation			
6.10.1 Are the applicable Libby guidance documents available for reference:			
6.10.1.1 EPA-Libby-2012-12 - Sampling and Analysis of Tree Bark for Asbestos?	☒	☐	
6.10.2 Drying and Ashing:			
6.10.2.1 Are the diameter and thickness of the tree bark samples measured and recorded to an accuracy of ±2 mm?	☒	☐	
6.10.2.2 Is the entire tree bark sample, which can sometimes be multiple core samples, weighed and placed in an oven for drying?	☒	☐	
6.10.2.2.1 Is the sample dried at 80ºC until the weight stabilizes (a minimum of 6 hours) and weighed?	☒	☐	
6.10.2.3 Is the tree bark sample then covered, placed in a muffle furnace at 450ºC for 18 hours (or until all organic matter has been removed), and weighed?	☒	☐	
6.10.2.3.1 Is the furnace ramped from 0ºC to 450ºC?	☒	☐	
6.10.3 Acid Treatment:			
6.10.3.1 After adding approximately 1-2 mL of DI water, is 10-20 mL of concentrated HCL added until no further reaction is visible (approx. 3-5 minutes)?	☒	☐	
6.10.3.2 Are samples diluted, transferred to a 100 mL container (with lid), and brought to a final volume of 100 mL with fiber-free DI water?	☒	☐	
6.10.3.3 Are samples capped, inverted 5-6 times, and sonicated for 2 minutes in preparation for filtering?	☒	☐	
6.10.4 Filtration:			
6.10.4.1 Are 5-20 mL of solution transferred to a second container and brought to a volume of 100 mL with fiber-free DI water?	☒	☐	
6.10.4.2 Are dilutions agitated (inverted 5-6 times) and filtered through a 47 mm MCE filter (0.45 µm pore size)?	☒	☐	
6.10.4.2.1 Are additional dilutions prepared if the loading on the filter appears either too heavy (>20%) or too light?	☒	☐	
6.10.5 Are all dilution volumes recorded on an indirect preparation bench sheet, and provided in the associated data deliverable?	☒	☐	
6.10.6 Are TEM grids prepared as described in Section 6.7 of this checklist?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.11 OU3 Duff Sample Preparation			
6.11.1 Are the applicable Libby guidance documents available for reference:			
6.11.1.1 EPA-Libby-2012-11 - Sampling and Analysis of Duff for Asbestos?	☒	☐	
6.11.2 Drying and Ashing:			
6.11.2.1 Are the appropriate number of aluminum trays weighed and tared?	☒	☐	
6.11.2.1.1 For tracking purposes, is each tray marked with a unique number?	☒	☐	
6.11.2.2 Are trays filled to approximately ¾, dried at 60ºC until the weight stabilizes a minimum of 10 hours, and weighed?	☒	☐	
6.11.2.3 Are dried duff samples transferred to covered pans and placed in a muffle furnace at 450ºC for 18 hours, or until all organic matter has been removed, and weighed?	☒	☐	
6.11.2.4 Are ashed samples transferred to Zip-lock bags and homogenized?	☒	☐	
6.11.2.4.1 If an individual sample was split between multiple trays, was it combined into one Zip-lock bag?	☒	☐	
6.11.3 Acid Treatment:			
6.11.3.1 After adding approximately 1-2 mL of DI water to 0.25 grams (measured to ±0.01 g) of ashed sample, is 10-20 mL of concentrated HCL added until no further reaction is visible (approx. 3-5 minutes)?	☒	☐	
6.11.3.2 Are samples diluted, transferred to a 100 mL container (with lid) and brought to a final volume of 100 mL with fiber-free DI water?	☒	☐	
6.11.3.3 Are samples capped, inverted 5-6 times, and sonicated for 2 minutes in preparation for filtering?	☒	☐	
6.11.4 Filtration:			
6.11.4.1 Is 0.1-1.0 mL of solution transferred to a second container and brought to a volume of 100 mL with fiber-free DI water?	☒	☐	
6.11.4.2 Are dilutions agitated (inverted 5-6 times) and filtered through a 47 mm MCE filter (0.45 µm pore size)?	☒	☐	
6.11.4.2.1 Are additional dilutions prepared if the loading on the filter appears either too heavy (>20%) or too light?	☒	☐	
6.11.5 Are all dilution volumes recorded on an indirect preparation bench sheet, and provided in the associated data deliverable?	☒	☐	
6.11.6 Are TEM grids prepared as described in Section 6.7 of this checklist?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.12 FBAS Filter Sample Preparation			
6.12.1 Are overloaded filter samples generated by the Fluidized Bed Asbestos Segregator (FBAS) prepared in accordance with the Rock Flour Preparation procedure described in Laboratory Modification LB-000091:			Since this laboratory has not received any FBAS filters requiring indirect preparation, Section 6.12 was completed based on equipment availability and familiarity with the procedure.
6.12.1.1 Ashed and suspended in 100 mL of an aqueous solution in a container with a tightly sealed lid?	☒	☐	
6.12.1.2 Is the container thoroughly homogenized?	☒	☐	
6.12.1.3 Sonicated for 3 minutes?	☒	☐	
6.12.1.4 Poured into a 100 mL graduated cylinder, with the volume recorded to the nearest 1 mL?	☒	☐	
6.12.1.5 Allowed to settle for 3 hours within the graduated cylinder?	☒	☐	
6.12.1.6 After 3 hours are 50 mL of the suspension pipette collected above the 50 mL mark of the graduated cylinder and transferred to another container?	☒	☐	
6.12.1.7 Are the 50 mL of suspension homogenized prior to collecting an aliquot for filtration onto a secondary filter?	☒	☐	
6.12.2 Are all dilution volumes recorded on an indirect preparation bench sheet, and provided in the associated data deliverable?	☒	☐	
6.12.3 Are TEM grids prepared as described in Section 6.7 of this checklist?	☒	☐	
6.13 Grid Preparation/Filtrate Storage			
6.13.1 For indirect preparations, are remaining filtrates filtered onto the appropriate filter(s) to be archived?	☒	☐	
6.13.2 Are all remaining filters and filter portions labeled prior to archiving?	☒	☐	
6.13.3 Are grids stored in marked grid storage boxes or other suitable containers and stored in a dust/fiber free environment?	☒	☐	
6.13.4 Is the location of grid preparation recorded in such a manner that they can be retrieved upon request in a timely manner?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

6.0 TRANSMISSION ELECTRON MICROSCOPY (TEM) GRID PREPARATION	Yes	No	Comments
6.14 Quality Control Samples			
6.14.1 Are quality control samples prepared at the described frequency:			
6.14.1.1 Are laboratory blanks (LBs) prepared at a frequency of 4% or with each preparation batch, whichever is more frequent?	☒	☐	
6.14.1.2 Are re-preparations prepared at a frequency of 1%?	☒	☐	
6.14.2 Is there a system in place to track and assign quality control analyses for samples associated with SAP Summaries that have different frequency requirements than those found in the most recent revision of Laboratory Modification LB-000029?	☒	☐	
6.15 Standard Operating Procedures (SOPs)			
6.15.1 Are the applicable laboratory SOPs available and followed by laboratory personnel (list)?	☐	☒	Refer to Finding No. 4 of the On-site Audit Report.

Document Title	Control No.	Description
Carbon Coater	Rev. 4.1 (5/2/2012)	
Direct Transfer Filter Prep	Rev. 1.4 (8/8/2013)	
TEM GO Measurement	Rev. 5 (3/22/2013)	
Plasma Asher	Rev. 4.1 (12/11/2013)	

6.16 Document Control	Yes	No	Comments
6.16.1 Are all logbooks, notebooks, forms, or other laboratory documents legible, accurate, and complete (list)?	☐	☒	

Document Title	Description/Comments
Balance calibration	Balances are calibrated using three sets of NIST traceable weights.
Muffle Furnace Calibration	Calibrated at the specified frequencies.
Drying Furnace Calibration	Calibrated at the specified frequencies.

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

7.0 TEM ANALYSIS	Yes	No	Comments
7.1 Are TEM areas adequate, clean, and orderly?	☒	☐	
7.2 Are steps taken to prevent the cross-contamination of equipment, supplies, and reagents?	☒	☐	

Personnel Interviewed

Name	Title	Experience
Leslie McCluskey-Eissing	TEM Analyst	4 years
Robyn Denton	Special Projects Manager	13 Years

7.3 Methods and Guidance Documents	Yes	No	Comments
7.3.1 What method(s) does the laboratory use to analyze samples by TEM:			
7.3.1.1 40 CFR, Chapter 1, Part 763, Subpart E (AHERA)?	☒	☐	
7.3.1.2 ISO 10312:1995 E - Determination of Asbestos Fibers?	☒	☐	
7.3.1.3 ASTM D 5755-09 - Microvacuum Sampling and Indirect Analysis of Dust by TEM?	☒	☐	
7.3.1.4 EPA Method 100.2 - Determination of Asbestos Structures Over 10 µm in Length in Drinking Water?	☒	☐	
7.3.1.5 Others (list)? _____	☐	☒	
7.3.2 Are project-specific requirements communicated to laboratory personnel and available for reference:			
7.3.2.1 Laboratory Modifications?	☒	☐	All project specific documents and EDD templates are available in the CDM Smith eRoom.
7.3.2.2 Project-specific SOPs?	☒	☐	
7.3.2.3 SAP Analytical Summaries?	☒	☐	
7.3.2.4 Project-specific Electronic Data Deliverables (EDDs)?	☒	☐	
7.3.2.5 Other (list)? _____	☐	☒	
7.4 TEM Instrumentation			
7.4.1 Does TEM instrumentation meet the following requirements:			
7.4.1.1 Capable of being operated at between 80 and 120 kV?	☒	☐	
7.4.1.2 Electron diffraction (ED) and energy dispersive X-ray (EDX) capabilities?	☒	☐	
7.4.1.3 Fluorescent screen with an inscribed or overlaid calibrated scale?	☒	☐	
7.4.2 Are the instruments equipped with thin film or Beryllium windows (list below)?	☒	☐	
7.4.3 Are all routine and non-routine maintenance activities recorded in instrument-specific logbooks?	☒	☐	

Instrument No.	Make	Model	Capabilities
04-1	100CX-2	JOEL	Horizontal detector w/Be window
04-3	1200EX	JOEL	Horizontal detector w/Be window
04-5	100CX-2	JOEL	Horizontal detector w/Be window
04-6	1200EX2	JOEL	Horizontal detector w/Be window

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

7.0 TEM ANALYSIS	Yes	No	Comments
7.5 Instrument Calibration (Laboratory Modification LB-00085)			
7.5.1 Is microscope alignment performed daily:			
7.5.1.1 Centering of electron beam?	☒	☐	
7.5.1.2 Electron beam is properly stigmated on either side of crossover?	☒	☐	
7.5.1.3 Image properly focused?	☒	☐	
7.5.2 Is the TEM screen magnification calibrated monthly?	☒	☐	
7.5.3 Is the camera constant calibrated monthly?	☒	☐	
7.5.4 Is the spot size diameter determined to be less than 250 nm quarterly?	☒	☐	
7.5.5 Is the low beam dose (≥15 seconds for Chrysotile) verified quarterly?	☒	☐	
7.5.6 EDXA System:			
7.5.6.1 Is X-ray energy versus channel for two peaks (i.e., Cu/Al) checked daily?	☒	☐	
7.5.6.2 Is detector resolution (Mn) checked quarterly?	☒	☐	
7.5.6.3 Are K-factors performed quarterly:			
7.5.6.3.1 BIR-1G (Na, Mg, Al, Ca, and Fe relative to Si)?	☒	☐	
7.5.6.3.2 Orthoclase (K and Al relative to Si)?	☒	☐	
7.5.7 Are instrument calibration records maintained in instrument-specific logbooks?	☒	☐	
7.5.8 Are calibrations uploaded to the eRoom on a quarterly basis?	☒	☐	
7.6 Reference Materials			
7.6.1 Does the laboratory maintain a library of reference materials on Asbestos and other fiber types?	☒	☐	
7.6.2 Are instrument-specific “LA” spectra available for reference?	☒	☐	
7.7 Grid Acceptance/Rejection Criteria			
7.7.1 Grid preparation rejection criteria:			
7.7.1.1 The replica is too dark due to poor dissolution?	☒	☐	
7.7.1.2 Replica is doubled or folded?	☒	☐	
7.7.1.3 Replica has >25% obscuration rejected?	☒	☐	
7.7.1.4 Replica has <50 intact grid openings?	☒	☐	
7.7.2 Are samples associated with grids determined to be overloaded (>25%) re-prepped using the indirect-transfer technique described in SOP EPA-Libby-08 and Laboratory Modification LB-000091?	☒	☐	
7.7.2.1 For samples prepared indirectly, is a loading of between 10% and 25% achieved for the secondary filter?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

7.0 TEM ANALYSIS	Yes	No	Comments
7.8 Modifications to AHERA & ASTM D5755:			
7.8.1 Most recent revision of Laboratory Modification LB-000031:			
7.8.1.1 Are structures classified as fibers (F), bundles (B), clusters (C), or matrices (M)?	☒	☐	
7.8.1.2 Unless identified as a "close call," are NAMs not recorded?	☒	☐	
7.8.1.3 Is the designation "ND" used to document when no structures are detected in a grid opening?	☒	☐	
7.8.1.4 Are fibers, bundles, clusters and matrices only recorded when they contain individual constituent fibers meeting the aspect ratio criterion?	☒	☐	
7.8.1.5 The overall aspect ratio of bundles, clusters, and matrices, may have any value?	☒	☐	
7.8.1.6 Are non-countable structures recorded, but not counted, for informational purposes?	☒	☐	
7.8.1.7 Is the entire length recorded for structures originating in one grid opening and extending to an adjacent grid opening?	☒	☐	
7.8.1.8 Are the actual lengths and widths of fibers, bundles, clusters and matrices recorded?	☒	☐	
7.8.1.9 For disperse matrices and clusters, is the length of the longest protruding structure recorded?	☒	☐	
7.8.1.10 For analyses with less than 50 grid openings (GOs) counted, is selection random and are adjacent GOs avoided?	☒	☐	
7.9 Modifications to ISO Method 10312:			
7.9.1 Most recent revision of Laboratory Modification LB-000016:			
7.9.1.1 Recording of "close call" NAMS as described in the most recent revision of Laboratory Modification LB-000066?	☒	☐	
7.9.1.2 Recording of bundles only if they contain individual constituent fibers meeting the aspect ratio criteria?	☒	☐	
7.9.1.3 Recording of bundles, compact clusters, and compact matrices regardless of aspect ratio?	☒	☐	
7.9.1.4 Recording of structures that intersect countable and non-countable grid bars:			
7.9.1.4.1 Cross Grid Bar Length Doubled (XGBLD)?	☒	☐	
7.9.1.4.2 Crosses Non-Countable Grid Bar Length Doubled (XNCGBLD)?	☒	☐	
7.9.1.5 Recording of component structures, within non-countable structures, which do not intersect non-countable grid bars?	☒	☐	
7.9.1.6 Recording of disperse clusters and matrices?	☒	☐	
7.9.1.7 Are the recorded rules for partially obscured structures properly applied (i.e., MFO and MBO)?	☒	☐	
7.9.1.8 Are the counting and recording rules for the identification of PCMe structures at "low magnification" applied?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

7.0 TEM ANALYSIS	Yes	No	Comments
7.10 Common TEM Modifications:			
7.10.1 Most recent revision of Laboratory Modification LB-000066:			
7.10.1.1 Is the presence or absence of Sodium and Potassium recorded for all LA, OA, and NAM particles (NaK, NaX, XK, or XX)?	☒	☐	
7.10.1.2 Is probable mineral identification code recorded for all particles?	☒	☐	
7.10.1.2.1 Are LA particles identified as WRTA, AC, TR, or AT?	☒	☐	
7.10.1.2.2 Are OA particles identified as AM, AN, CR, or NR?	☒	☐	
7.10.1.2.3 Are NAMs indicated as PY, OT, or UN?	☒	☐	
7.10.1.3 Is one SAED pattern recorded for each amphibole Asbestos type encountered per samples?	☒	☐	
7.10.1.4 Are EDS spectrum (a maximum of 5) collected for up to 5 LA, 5 NR, and 5 Close-call NAM per sample?	☒	☐	
7.10.1.5 To the extent possible, are all EDS spectra collected for sufficient time that key peaks (i.e., Na, K, and Al) can be distinguished from background?	☒	☐	
7.10.1.6 To the extent possible, are all EDS spectra collected for sufficient time that the Si peak contains 1,000 or more counts?	☒	☐	
7.10.2 Most recent revision of Laboratory Modification LB-000067:			
7.10.2.1 Is the designation “ND” used to document when no structures are detected in a grid opening?	☒	☐	
7.10.2.2 Do hardcopy bench sheets include sketches of all Asbestos structures observed, up to a maximum of 50?	☒	☐	
7.10.2.2.1 Do these sketches contain sufficient detail?	☒	☐	
7.10.2.3 Are the structure identification codes described in Tables D.1 and D.2 of ISO Method 10312 used?	☒	☐	
7.10.2.4 Are laboratory blanks assigned the sample number LQ-00001 and assigned the appropriate tag (i.e., AL1, REP1, and FBA1)?	☒	☐	
7.10.2.5 Is the preparation date for blanks the date on which it is introduced to the sample train?	☒	☐	
7.10.2.6 Is the preparation date for field samples the date on which the preparation is initiated?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

7.0 TEM ANALYSIS	Yes	No	Comments
7.11 Counting/Stopping rules:			
7.11.1 Are the Analytical Summaries reviewed to determine the following:			
7.11.1.1 Analytical Sensitivity?	☒	☐	
7.11.1.2 Recording rules?	☒	☐	
7.11.1.3 Stopping rules?	☒	☐	
7.11.1.4 Applicable Laboratory Modifications?	☒	☐	
7.11.1.5 Investigative or non-investigative?	☒	☐	
7.12 Quality Control Analyses (Laboratory Modification LB-000029)			
7.12.1 Are quality control samples analyzed at the required frequencies:			
7.12.1.1 Laboratory blanks - Frequency of 4%?	☒	☐	
7.12.1.2 Recount Same (RS) - Frequency of 1%?	☒	☐	
7.12.1.3 Recount Different (RD) - Frequency of 2.5%?	☒	☐	
7.12.1.4 Verified Analysis (VA) - Frequency of 1%?	☒	☐	
7.12.1.5 Re-preparations - Frequency of 1%?	☒	☐	
7.12.2 Is there a system in place to track and assign quality control analyses for samples associated with SAP Summaries that have different frequency requirements than those found in the most recent revision of Laboratory Modification LB-000029?	☒	☐	
7.12.3 Are samples selected for RS, RD and VA analyses in accordance with the most recent revision of Laboratory Modification LB-000029?	☒	☐	
7.12.4 Is the procedure used to evaluate QC sample analyses in accordance with the most recent revision of Laboratory Modification LB-000029?	☒	☐	
7.13 Standard Operating Procedures (SOPs)			
7.13.1 Are the applicable laboratory SOPs available and followed by laboratory personnel (list)?	☒	☐	

Document Title	Control No.	Description
ASTM D5755-09	Rev. 3.1 (11/2/2012)	
TEM EDX	Rev. 1.2 (1/29/2014)	
EPA 100.2	Rev. 14.3(8/8/2013)	
ISO 10312	Rev. 9.1 (2/16/2012)	
ISO 13794	Rev. 1.2 (3/1/2013)	
SAED	Rev. 0 (12/7/2012)	
AHERA	Rev. 14.3 (4/5/2013)	

7.14 Document Control	Yes	No	Comments
7.14.1 Are all logbooks, notebooks, forms, or other laboratory documents legible, accurate, and complete (list)?	☒	☐	

Document Title	Description/Comments
Instrument Maintenance	TEM maintenance records
Instrument Records	TEM calibration records

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.1 Are PLM areas adequate, clean, and orderly?	☒	☐	
8.2 Are steps taken to prevent the cross-contamination of equipment, supplies, and reagents?	☒	☐	
Personnel Interviewed			

Name	Title	Experience
Garret Vliet	PLM Supervisor	4 Years
Melissa Klinedinst	PLM QC Group Leader	7 Years

8.3 Methods and Guidance Documents	Yes	No	Comments
8.3.1 Are the applicable guidance documents available for reference:			
8.3.1.1 EPA SOP SRC-Libby-01?	☒	☐	All project specific documents and methods are available in the CDM Smith eRoom.
8.3.1.2 EPA SOP SRC-Libby-03?	☒	☐	
8.3.1.3 NIOSH 9002, Issue 2 - Asbestos (Bulk) by PLM?	☒	☐	
8.3.1.4 Others (list)?	☐	☒	
8.3.2 Are project-specific requirements communicated to laboratory personnel and available for reference:			
8.3.2.1 Laboratory Modifications:			
8.3.2.1.1 Most current revision of LB-000097?	☒	☐	
8.3.2.1.2 Most current revision of LB-000098?	☒	☐	
8.3.2.2 SAP Analytical Summaries?	☒	☐	
8.3.2.3 Project-specific Electronic Data Deliverables (EDDs)?	☒	☐	
8.3.2.4 Others (list)?	☐	☒	
8.4 Equipment			
8.4.1 Ventilation Hoods:			
8.4.1.1 Checked routinely and recorded in a permanent logbook?	☒	☐	
8.4.2 Drying oven:			
8.4.2.1 Checked routinely and recorded in a permanent logbook?	☒	☐	In bulk preparation area.
8.4.3 Muffle furnace:			
8.4.3.1 Checked routinely and recorded in a permanent logbook?	☒	☐	In bulk preparation area.

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.4.4 Analytical Balances:			
8.4.4.1 Do the balances meet the following criteria:			
8.4.4.1.1 Accurate to 1 mg (0.001 g)?	☒	☐	
8.4.4.1.2 Upper range of at least 100 g?	☒	☐	
8.4.4.2 Checked routinely and recorded in a permanent logbook?	☒	☐	
8.4.4.2.1 Are balances calibrated using at least three weights?	☒	☐	
8.4.4.3 Has the balance been calibrated within the last 12 months by a third party vendor?	☒	☐	
8.4.4.4 Are the weights used traceable to national standards for weights and measures and certified by a third party with the last 5 years?	☒	☐	
8.4.4.5 Are both the balance and weights labeled with the following information:			Refer to Finding No. 4 of the On-site Audit Report.
8.4.4.5.1 Date of certification?	☐	☒	
8.4.4.5.2 Initials of individual performing the certification?	☐	☒	
8.4.4.5.3 Date next service is to be performed?	☐	☒	
8.5 Stereomicroscope			
8.5.1 Do stereomicroscopes meet the following requirements:			
8.5.1.1 Magnification range of 10X to 50X?	☒	☐	
8.5.1.2 Incandescent or fluorescent light source?	☒	☐	
8.6 Polarized Light Microscope			
8.6.1 Are PLMs equipped with the following:			
8.6.1.1 Light source and replacement bulbs?	☒	☐	
8.6.1.2 Binocular observation tube?	☒	☐	
8.6.1.3 Blue daylight filter?	☒	☐	
8.6.1.4 Oculars (10X)?	☒	☐	
8.6.1.5 Objectives: 10X, 20X, and 40X (or similar)?	☒	☐	
8.6.1.6 10X dispersion staining objective?	☒	☐	
8.6.1.7 A 360 degree graduated rotating stage?	☒	☐	
8.6.1.8 Polarizer and analyzer aligned at 90 degrees to one another?	☒	☐	
8.6.1.9 Bertrand lens?	☒	☐	
8.6.1.10 Substage condenser with iris diaphragm?	☒	☐	
8.6.1.11 Accessory slot for compensator plate?	☒	☐	
8.6.1.12 First order red (530-550 nanometer) compensator plate?	☒	☐	
8.6.1.13 Crosshair reticle?	☒	☐	
8.6.1.14 Adjustment tools?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.7 Are microscopes well-maintained, and are all routine and non-routine maintenance activities recorded in instrument-specific logbooks?	☒	☐	

Instrument No.	Make	Model	Capabilities
#2	Leica	DM750P	Standard
#9	Leica	DMEP	Standard
#10	Leica	DM750P	Standard

8.8 Refractive Index Liquids	Yes	No	Comments
8.8.1 What refractive index liquids are available:			
8.8.1.1 High dispersion RI liquids from 1.620 to 1.640?	☒	☐	
8.8.1.2 1.550 high dispersion RI liquid?	☒	☐	
8.8.1.3 1.680 to 1.700 RI liquids?	☒	☐	
8.8.2 Are refractive index liquids checked daily for contamination?	☒	☐	Salt is used.
8.8.3 Are refractive index (RI) liquids calibrated monthly using a refractometer or other means (describe)?	☒	☐	
8.9 Reference Materials			
8.9.1 Does the laboratory maintain a library of Asbestos and non-Asbestos reference materials:			
8.9.1.1 NIST SRM 1866b (Ch, Am, and Cr)?	☒	☐	
8.9.1.2 NIST SRM 1867a (Tr, Ac, and An)?	☒	☐	
8.9.1.3 USGS LA PEs:	☒	☐	
8.9.1.3.1 LA 0.2% by mass?	☒	☐	
8.9.1.3.2 LA 1.0% by mass?	☒	☐	
8.9.1.3.3 Other (list)?	☐	☒	
8.9.1.4 Controlled LA Asbestos (USGS)?	☒	☐	
8.9.1.5 NIST testing round M12001 (Winchite/Richterite)?	☒	☐	
8.9.1.6 Non-Asbestos (i.e., Gypsum, Calcite, and Fiberglass)?	☒	☐	
8.10 PLM Calibration			
8.10.1 For PLM, is the following performed daily:			
8.10.1.1 Alignment?	☒	☐	
8.10.1.2 Stage and objectives centered?	☒	☐	
8.10.1.3 Optic axis centered?	☒	☐	
8.10.1.4 Alignment of the upper/lower polars?	☒	☐	
8.10.1.5 Centered through substage condenser and iris diaphragm?	☒	☐	
8.10.2 Microscope adjustments verified and recorded prior to sample analyses?	☒	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.11 PLM Analysis by NIOSH Method 9002:			
8.11.1 Does the laboratory perform PLM analyses on samples received from the Libby Superfund site? If "**NO**," proceed to Section 8.13 of the checklist.	☐	☒	
8.11.2 Are samples visually examined by stereomicroscope for the following:			
8.11.2.1 Color?	☐	☐	
8.11.2.2 Homogeneity?	☐	☐	
8.11.2.3 Texture?	☐	☐	
8.11.3 Which of the following techniques are used to prepare samples for analysis:			
8.11.3.1 Mortar & pestle?	☐	☐	
8.11.3.2 Acid washing?	☐	☐	
8.11.3.3 Ashing?	☐	☐	
8.11.3.4 Solvents?	☐	☐	
8.11.3.5 Other (list)?	☐	☐	
8.11.4 For non-friable, organically bound samples requiring ashing and/or acid reduction, are all necessary weights and tare weights measured and recorded?	☐	☐	
8.11.5 Are slides prepared using the appropriate refractive index liquid(s) and scanned for Asbestos fibers using the following optical properties:			
8.11.5.1 Morphology?	☐	☐	
8.11.5.2 Color?	☐	☐	
8.11.5.3 Refractive indices?	☐	☐	
8.11.5.4 Pleochroism?	☐	☐	
8.11.5.5 Birefringence?	☐	☐	
8.11.5.6 Extinction characteristics?	☐	☐	
8.11.5.7 Sign of elongation?	☐	☐	
8.11.5.8 Dispersion staining characteristics?	☐	☐	
8.11.6 Are the observed optical properties compared to Table 1 (Optical Properties of Asbestos Fibers) to determine the Asbestos mineral present?	☐	☐	
8.11.7 Is a qualitative assessment of Asbestos content made from both the gross and microscopic examinations?	☐	☐	
8.11.8 If no fibers are detected in a homogeneous samples are at least two additional slides prepared and analyzed prior to concluding no Asbestos is present?	☐	☐	
8.11.9 Is at least one optical property recorded for fibers determined to be non-Asbestos fibers?	☐	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.12 PLM Analysis by PLM Point Count (PC400):			
8.12.1 Are samples analyzed by NIOSH 9002 with results of less than 1% LA further analyzed by PLM Point Count (PC)?	☐	☐	
8.12.2 What type of ocular reticle is used (i.e., cross line or point array)? _____			
8.12.3 At what magnification are samples analyzed? _____			
8.12.4 Are samples analyzed accordingly:			
8.12.4.1 Count only points directly over non-empty (occupied) areas?	☐	☐	
8.12.4.2 For areas where Asbestos and non-Asbestos fibers overlap, is a point scored for both categories?	☐	☐	
8.12.4.3 Are points with several overlapping particles avoided?	☐	☐	
8.12.4.4 Are Asbestos fibers observed (but not lying under a point noted) not counted?	☐	☐	
8.12.4.5 Are a minimum of 400 points counted for each sample?	☐	☐	
8.12.4.6 Are Asbestos counts categorized by type (i.e., LA, CH, and OA)?	☐	☐	
8.12.5 How many slides are prepared to reach the required 400 non-empty points?	☐	☐	
8.12.6 Is point count data recorded on a laboratory bench sheet?	☐	☐	
8.12.7 Is point count data transcribed to the appropriate EDD?	☐	☐	

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.13 PLM-VE (SOP SRC-Libby-03)			
8.13.1 Stereomicroscopic Examination:			
8.13.1.1 Are sample preparation activities performed within a HEPA-filtered hood?	☒	☐	
8.13.1.2 Is the entire sample transferred to an Asbestos-free container for examination?	☒	☐	
8.13.1.2.1 Is the container a minimum of 100 mm in diameter?	☒	☐	
8.13.1.2.2 If non-disposable, is a daily contamination check performed?	☒	☐	
8.13.1.3 Is the entire sample examined for homogeneity and the presence of suspect fibers?	☒	☐	
8.13.1.4 Are suspect fibers removed with fine forceps and mounted in the appropriate RI liquid for PLM analysis?	☒	☐	
8.13.1.5 Are the following stereomicroscopic findings recorded:			
8.13.1.5.1 Sample appearance?	☒	☐	
8.13.1.5.2 Estimated percentage of LA?	☒	☐	
8.13.1.5.3 Estimated percentage of other Asbestos types?	☒	☐	
8.13.2 Determination for Ashing the Sample:			
8.13.2.1 Are soil samples containing a significant amount of artifacts ashed prior to being prepared for random PLM mounts?	☒	☐	
8.13.2.1.1 Are samples ashed in a muffle furnace at approximately 480°C?	☒	☐	
8.13.2.1.2 Are the necessary gravimetric measurements recorded for the determination of "Pre-ash percent Asbestos"?	☒	☐	
8.13.3 Determination for Additional Grinding:			
8.13.3.1 As necessary, are samples ground by a mortar and pestle?	☒	☐	
8.13.3.2 Is the mortar and pestle cleaned between samples and a daily contamination check performed?	☒	☐	
8.13.4 Slide Preparation for PLM-VE:			
8.13.4.1 Are a minimum of five random sub-samples mounted in the appropriate RI liquid (1.620-1.640) for measurement of LA optical properties?	☒	☐	
8.13.5 Supplemental Stereomicroscopic Evaluation:			
8.13.5.1 Following the random slide mount preparation, is the container agitated to cause the particulate to settle and Asbestos fibers sort to the surface?	☒	☐	
8.13.5.2 Is the sample re-examined, and the fiber pick procedure repeated?	☒	☐	

Additional Comments:

Analyst demonstrated modified (LB-000096) PLM-VE technique on previously analyzed Inter-lab samples that were weakly discordant from original results. For each of the samples reanalyzed, the result reported for the inter-laboratory study was confirmed.

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.14 PLM-GRAV (SOP SRC-Libby-01)			
8.14.1 Stereomicroscopic Examination:			
8.14.1.1 Is the entire sample weighed and placed in an appropriate container?	☒	☐	
8.14.1.2 Does the stereomicroscopic examination include:			
8.14.1.2.1 Examination of multiple fields of view over the entire sample?	☒	☐	
8.14.1.2.2 Probing of the sample and breaking clumps where possible?	☒	☐	
8.14.1.2.3 Manipulation of the sample with the appropriate tools?	☒	☐	
8.14.1.2.4 Observations for homogeneity, texture, friability, color, and extent of any Asbestos content?	☒	☐	
8.14.1.3 Does the analyst refrain from segregating and weighing particles smaller than 2-3 mm (1/10 inch)?	☒	☐	
8.14.1.4 If no particles larger than 2-3 mm or larger are present, are one of the following recorded:			
8.14.1.4.1 No Asbestos detected (ND)?	☒	☐	
8.14.1.4.2 Trace levels of Asbestos observed, but not quantified (Tr)?	☒	☐	
8.14.2 Examination by PLM:			
8.14.2.1 Are tentatively identified Asbestos particles examined by PLM as described in SOP SRC-Libby-3 (Section 8.12 of this checklist)?	☒	☐	
8.14.2.2 If Asbestos particles are determined to be OA, are they further characterized:			
8.14.2.2.1 Amosite (AMOS)?	☒	☐	
8.14.2.2.2 Anthophylite (ANTH)?	☒	☐	
8.14.2.2.3 Crocidolite (CROC)?	☒	☐	
8.14.2.2.4 Unknown (UNK)?	☒	☐	
8.14.2.3 Is the total weight of each type of positively identified Asbestos measured and recorded?	☒	☐	
8.14.3 Record Keeping:			
8.14.3.1 Is the data log sheet provided in Attachment 1 of the SOP used to record weights the initial (coarse fraction) and segregated Asbestos?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.14.4 Classification of Asbestos Mineral Type:			
8.14.4.1 Using PLM, is entire area of each prepared slide examined for Asbestos, non-Asbestos and matrix material?	☒	☐	
8.14.4.2 Is positive identification determined from the following six optical properties:			
8.14.4.2.1 Habit (Asbestos or non-Asbestos)?	☒	☐	
8.14.4.2.2 Color & Pleochroism (if present)?	☒	☐	
8.14.4.2.3 Both Alpha and Gamma Refractive indices?	☒	☐	
8.14.4.2.4 Birefringence?	☒	☐	
8.14.4.2.5 Extinction angle?	☒	☐	
8.14.4.2.6 Sign of elongation (positive-slow or negative fast)?	☒	☐	
8.14.4.3 Based on the optical properties, is Asbestos classified into one of the following three categories:			
8.14.4.3.1 Libby Amphibole (LA)?	☒	☐	
8.14.4.3.2 Other Amphibole (OA)?	☒	☐	
8.14.4.3.3 Chrysotile (CH)?	☒	☐	
8.14.4.4 Is at least one optical property recorded for observed non-Asbestos fibers?	☒	☐	
8.14.5 Quantification of Asbestos Content:			
8.14.5.1 Is Asbestos reported as either mass or area percent for LA?	☒	☐	
8.14.5.2 Are other, non-LA, Asbestos types reported in area percent?	☒	☐	
8.14.5.3 Are reference materials used to aid in visual estimation:			
8.14.5.3.1 LA PE reference materials (0.2% or 1.0%)?	☒	☐	
8.14.5.3.2 Are visual estimates of greater than 1% LA performed using calibration standards made in-house from NIST SRMs and NIST PEs?	☒	☐	
8.14.6 Are calibrated visual estimates determined from both the detailed stereomicroscopic observations and examination of the total area for all five random slide mounts?	☒	☐	
8.14.7 Are LA results reported in the appropriate bin categories (PLM-VE only):			
8.14.7.1 Non-detects recorded as Bin A?	☒	☐	
8.14.7.2 Less than 0.2% LA recorded as Bin B1?	☒	☐	
8.14.7.3 Greater than 0.2%, but less than 1% LA recorded as Bin B2?	☒	☐	
8.14.7.4 Equal to or greater than 1% LA recorded as Bin C, with the percentage recorded as a whole number?	☒	☐	
Additional Comments:			

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

8.0 POLARIZED LIGHT MICROSCOPY (PLM)	Yes	No	Comments
8.15 Quality Control Analyses			
8.15.1 Are the following types of QC analyses performed at the required frequencies:			
8.15.1.1 Laboratory Duplicate Self-check (LDS) at a frequency of 2%?	☒	☐	
8.15.1.2 Laboratory Duplicate Cross-check (LDC) at the correct frequency:			
8.15.1.2.1 At a frequency of 4% for PLM-VE?	☒	☐	
8.15.1.2.2 At a frequency of 8% for PLM-Grav?	☒	☐	
8.15.1.3 Laboratory Duplicate Cross-check re-preparation (LDCR) at a frequency of 4% (PLM-VE only)?	NA	NA	This requirement has not been made final yet.
8.15.1.4 Is a second analyst available for LDC and LDCR analyses?	☒	☐	
8.15.2 For sample containing LA, are LDS, LDC and LDCR analyses considered acceptable if:			
8.15.2.1 LA results are within 1 Bin category?	☒	☐	
8.15.2.2 LA results are ≤1% LA?	☒	☐	
Note: For LA results greater than 1%, the laboratory should refer to their internal QA/QC system.			
8.15.3 Is the appropriate corrective action taken when LDS, LDC, or LDCR analyses do not meet acceptance criteria (describe)?	☒	☐	
8.16 Standard Operating Procedures (SOPs)			
8.16.1 Are the applicable laboratory SOPs available and followed by laboratory personnel (list)?	☐	☒	Refer to Finding No. 4 of the On-site Audit Report.

Document Title	Control No.	Description
PLM SOP	Rev. 12.1 (10/15/2012)	
RI Liquid Calibration	Rev. 1.4 (9/2/2010)	

8.17 Document Control	Yes	No	Comments
8.17.1 Are all logbooks, notebooks, forms, or other laboratory documents legible, accurate, and complete (list)?	☒	☐	

Document Title	Description/Comments
Balance Calibration Logbook	
Scope Calibration/Contamination Logbook	For Scope #10

Additional Comments:

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

9.0 DATA MANAGEMENT	PCM	TEM	PLM	Comments
9.1 Data Package Review and Assembly				
9.1.1 Are deliverables reviewed to ensure project-specific requirements in the following are met:				
9.1.1.1 Request for Modifications to Laboratory Activities?	☒	☒	☒	All project specific documents and EDD templates are available in the CDM Smith eRoom.
9.1.1.2 Project-specific SOPs?	☒	☒	☒	
9.1.1.3 SAP Analytical Summaries?	☒	☒	☒	
9.1.1.4 Project-specific Electronic Data Deliverables (EDDs)?	☒	☒	☒	
9.1.1.5 Other (list)? _____	☐	☐	☐	
9.1.2 Do scanned data packages meet the following requirements:				
9.1.2.1 A Case Narrative briefly describing the analytical method(s), any deviations from the method, and any other discrepancies?	☒	☒	☒	
9.1.2.2 A copy of the signed COC and other documentation included with the COC?	☒	☒	☒	
9.1.2.3 Sample information and final analytical results for all sample and QC analyses?	☒	☒	☒	
9.1.2.4 Copies of handwritten bench sheets and sample preparation logs for indirect preparations?	☒	☒	☒	
9.1.2.5 TEM spectra?	☒	☒	☒	
9.1.2.6 TEM structure morphology photos (if required)?	☒	☒	☒	
9.1.2.7 Additional documentation relevant to the test report (e.g., email)?	☒	☒	☒	
9.1.2.8 Reports are paginated?	☒	☒	☒	
9.1.3 Are all deliverables reviewed for completeness and accuracy prior to being submitted:				
9.1.3.1 Hardcopy deliverables?	☒	☒	☒	
9.1.3.2 Electronic deliverables?	☒	☒	☒	
9.1.4 Are all reviews documented?	☒	☒	☒	
9.1.5 Are supplements and corrections to minor errors (that do not affect the results or EDD) submitted in the following manner:				
9.1.5.1 A description of the corrections made (can be provided on the cover page or in a case narrative)?	☒	☒	☒	
9.1.5.2 The name, title and signature of an approved signatory?	☒	☒	☒	
9.1.5.3 Any additional paperwork showing corrections?	☒	☒	☒	
9.1.5.4 Verification initials/date and validation initials/date?	☒	☒	☒	
9.1.5.5 Update page numbers to include the added supplement?	☒	☒	☒	
9.1.6 A new, complete test report is generated anytime data are affected (resulting in a change to the EDD) and new data loaded into Scribe?	☒	☒	☒	
Additional Comments				

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

9.0 DATA MANAGEMENT	PCM	TEM	PLM	Comments
9.2 Data Submission				
9.2.1 Is the date that the electronic data deliverables (EDDs) are uploaded to the FTP site tracked and recorded?	☒	☒	☒	
9.2.2 Are EDDs also e-mailed to the required recipients?	☒	☒	☒	
9.2.3 Is the date that scanned data deliverables are uploaded to the FTP site tracked and recorded?	☒	☒	☒	
9.2.4 Is a system in place to ensure deliverables are submitted within the required TATS:				A spreadsheet is utilized.
9.2.4.1 Electronic Deliverables?	☒	☒	☒	Refer to Finding No. 5 of the On-site Audit Report.
9.2.4.2 Hardcopy (scanned)?	☐	☐	☐	
9.2.5 Does the laboratory post the required PLM, TEM, and PCM calibration data to the CDM eRoom as specified in the most recent revision of Laboratory Modification LB-000085?	☒	☒	☒	
9.3 Data Storage and Archiving				
9.3.1 Are electronic files archived onto suitable media on a frequent basis? How often? Daily	☒	☒	☒	Refer to Section 5.10.2 of the Control of Records SOP (Rev. 3.1, 2/04/2014).
9.3.2 Are all hardcopy data stored in a secured location with limited access (e.g., locking file cabinet, etc.)?	☒	☒	☒	

Additional Comments:

Note that, for the Libby Superfund project, all data entry, data review, and data package assembly procedures are performed for all of the EMSL Analytical laboratories in Cinnaminson, NJ by the Special Projects Data Coordinator.

LIBBY-SPECIFIC ASBESTOS LABORATORY ON-SITE AUDIT CHECKLIST

Method: Not Applicable Date(s) of On-site: March 25-26, 2014

10.0 QUALITY ASSURANCE/QUALITY CONTROL	PCM	TEM	PLM	Comments
10.1 Laboratory Certifications				
10.1.1 Is the laboratory accredited for Asbestos analysis under the National Voluntary Laboratory Accreditation Program (NVLAP):				Laboratory ID: 101048-0 Issued: 07/01/2013
10.1.1.1 Asbestos Fiber Analysis (TEM Method)?	NA	☒	NA	Expire: 06/30/2014
10.1.1.2 Asbestos Fiber Analysis (PLM Method)?	NA	NA	☒	
10.1.2 Is the laboratory accredited for Asbestos analysis under the American Industrial Hygiene Association (AIHA), and does it participate in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program?	☒	NA	NA	Laboratory ID: 100194 Issued: 07/31/2012 Expire: 07/01/2013
10.2 Training				
10.2.1 Have all analysts undergone training on the proper usage of the equipment and instrumentation used in the respective areas?	☒	☐	☒	Refer to Finding No. 3 of the On-site Audit Report.
10.2.2 Have all analysts demonstrated proficiency through the preparation and/or analysis of standards or samples of known values?	☒	☒	☒	
10.2.3 Are training records maintained in analyst-specific files?	☒	☒	☒	
10.3 Internal Audits				
10.3.1 Are internal audits conducted on an annual basis using an appropriate checklist?	☒	☒	☒	Conducted 05/08-10/2013.
10.3.1.1 Are internal audit reports available for review?	☒	☒	☒	Refer to Finding No. 6 of the On-site Audit Report.
10.4 Corrective/Preventive Action:				
10.4.1 Can the laboratory demonstrate the sequence of problem identification, corrective action, and resumption of duties?	☒	☒	☒	
10.5 Quality Records				
10.5.1 Are SOPs available in the applicable areas for all laboratory-specific procedures?	☒	☒	☒	
10.5.2 Does the laboratory have a Quality Assurance Manual?	☒	☒	☒	
10.5.3 Does the laboratory compile monthly quality assurance/quality control reports?	☒	☒	☒	
10.6 Environmental Controls/Laboratory Monitoring				
10.6.1 Does the laboratory conduct an environmental monitoring program?	☒	☒	☒	
10.6.2 Is quarterly air monitoring performed in all laboratory areas?	☒	☒	☒	
10.6.2.1 Are the collected samples analyzed by TEM with a target analytical sensitivity of 0.005 structures/cc?	☒	☒	☒	Air monitoring results for 2013/2014 reviewed prior to audit, with no structures detected.
10.6.2.2 If LA is detected, are the affected areas thoroughly cleaned and a new set of samples collected and analyzed?	☒	☒	☒	
Additional Comments:				